The 2006 Eruption of Augustine Volcano, Alaska
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Chapter 27

Public Outreach and Communications of the Alaska Volcano Observatory during the 2005–2006 Eruption of Augustine Volcano

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Abstract

The 2005–6 eruption of Augustine Volcano in the Cook Inlet region, Alaska, greatly increased public desire for volcano hazard information, as this eruption was the most significant in Cook Inlet since 1992. In response to this heightened concern, the Alaska Volcano Observatory (AVO) increased ongoing efforts to deliver specific eruption-focused information to communities nearest to the volcano, created a public communications strategy to assist staff with managing requests, and used the recently upgraded AVO Web site as a primary information-delivery path. During the eruption, AVO responded to a minimum of ~1,700 individual requests for information from the media, the public, and other organizations with responsibilities associated with volcanic activity in Alaska; requests were received both as phone calls to the observatory and e-mail stemming from the AVO Web site. Staff also delivered approximately two dozen Augustine-specific presentations and gave nearly three dozen tours of the AVO Anchorage Operations Center in Anchorage. This intensity of public interaction was markedly higher than during noneruptive periods.

During the Augustine unrest and eruption, AVO also refined its internal communication procedures, instituted and maintained up-to-date and concise talking points concerning the most recent and relevant volcanic activity and hazards, and created a media management plan to assist staff in working with members of the media. These items aided staff in maintaining a consistent message concerning the eruption, potential hazards, and our response activities.

The AVO Web site, with its accompanying database, is the backbone of AVO's external and internal communications. This was the first Cook Inlet volcanic eruption with a public expectation of real-time access to data, updates, and hazards information over the Internet. In March 2005, AVO improved the Web site from individual static pages to a dynamic, database-driven site. This new system provided quick and straightforward access to the latest information for (1) staff within the observatory, (2) emergency managers from State and local governments and organizations, (3) the media, and (4) the public. From mid-December 2005 through April 2006, the AVO Web site served more than 45 million Web pages and about 5.5 terabytes of data.

Introduction

Augustine Volcano is located about 280 km (174 miles) southwest of Anchorage, Alaska, and within about 300 km (186 miles) of the major population centers of south-central Alaska (fig. 1). Eruptions and landslides at Augustine pose well-documented hazards to the region's citizens and economy (Waythomas and Waitt, 1998). Explosive eruptions of Augustine have occurred on at least six previous occasions since the early 1800s (1812, 1883, 1935, 1964–65, 1976, and 1986). Early during the 1883 eruption, a part of the summit collapsed and formed a debris avalanche that extended beyond the coast. This initiated a small tsunami reported at English Bay, 90 km (56 miles) east of the volcano (Waitt and Begét, 2009).

Each of the most recent eruptions of Augustine (1976 and 1986) were preceded by roughly nine months of precursory seismicity and sent airborne ash throughout south-central Alaska and beyond. In 1976, turbines at the Beluga Power Plant, the primary power supply for Anchorage, were damaged when airborne ash was ingested (Swanson and Kienle, 1988;

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Waythomas and Waitt, 1998). Ash fall from the 1986 eruption of Augustine closed the Anchorage International Airport, and local military aircraft were moved to distant locations at the start of the 1986 eruptions (Kienle, 1994; Waythomas and Waitt, 1998).

Following Augustine's eruption in 1986, the Alaska Volcano Observatory (AVO) was founded in 1988 as a joint program of the U.S. Geological Survey (USGS), the Geophysical Institute of the University of Alaska Fairbanks (UAFGI), and the State of Alaska Division of Geological and Geophysical Surveys (ADGGS) in Fairbanks. AVO's primary missions are to conduct investigations to assess the likelihood and type of volcanic activity and to communicate timely warnings of volcanic unrest and eruptions of Alaska's volcanoes to local, State, and Federal officials and the public (Eichelberger and others, 1995). Since its inception, AVO has responded to a number of eruptions in Alaska, but the recent eruption of Augustine was the first in the Cook Inlet region since that of Mount Spurr's Crater Peak vent in 1992.

The 2005–6 Augustine eruption followed a similar pattern to previous historical eruptions of the volcano. After phreatic explosions on December 15, 2005, and January 11, 2006, Augustine began an explosive magmatic eruption on January 13 that tapered to effusive activity that lasted through March (Power and others, 2006). The eruption followed several months of precursory activity (increasing seismicity,

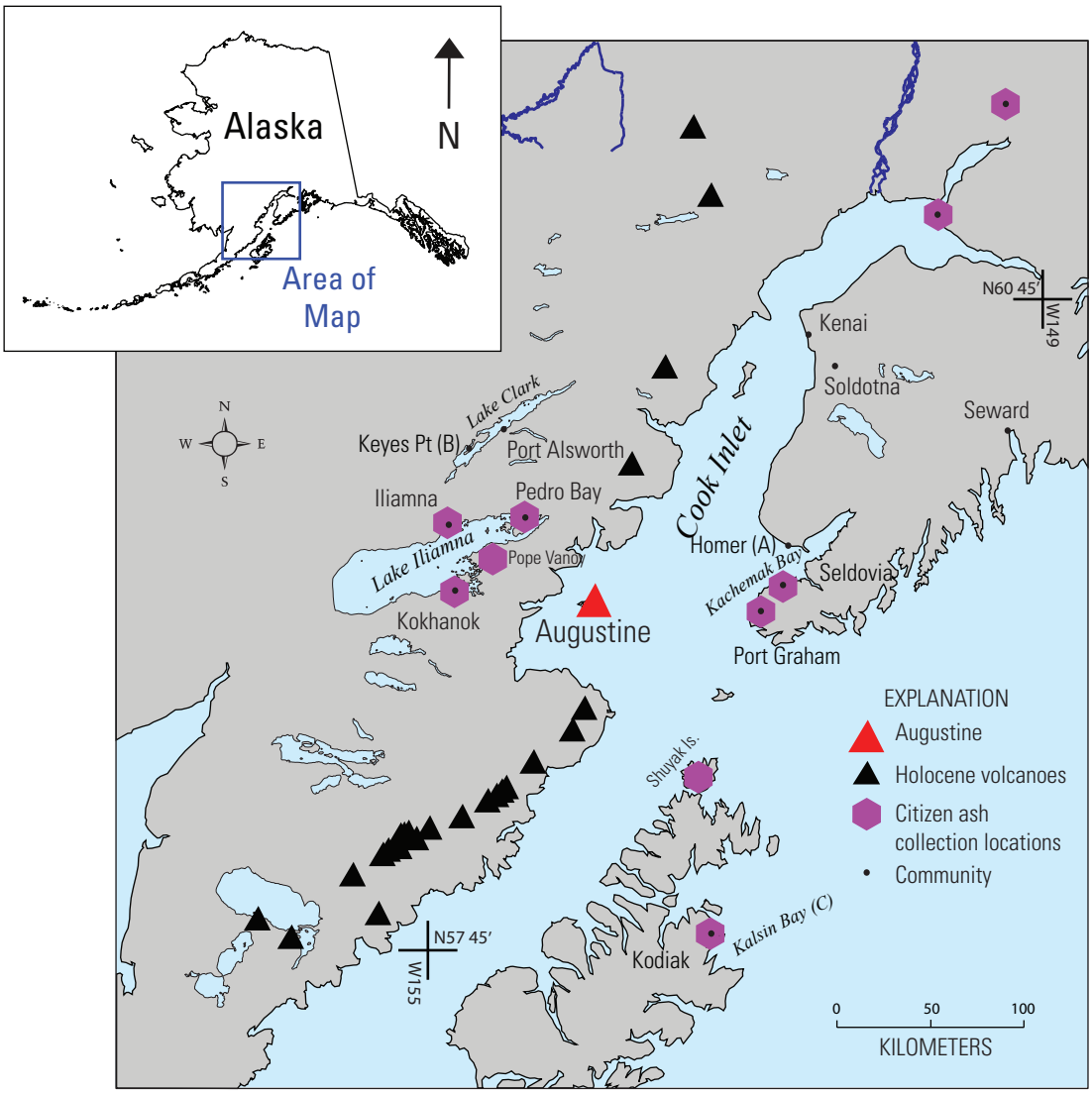

Figure 1. Cook Inlet and Kenai Peninsula region map including Augustine Volcano, surrounding Holocene volcanoes, and nearby communities. Communities from which volcanic ash was collected and submitted are indentified. The Alaska Volcano Observatory (AVO) also received volcanic ash collected from Castella, Calif.

deformation, and gas emission; Cervelli and others, this volume; Power and Lalla, this volume; Jacobs and McNutt, this volume; McGee and others, this volume).

Because of Augustine's prior historic eruptions and the more recent eruptions of Mount Spurr (1992) and Redoubt Volcano (1989–90), many longstanding Alaska residents are familiar with ash fall and other volcanic hazards. As Augustine began to exhibit unrest, however, questions raised at community meetings and e-mailed to the AVO Web site revealed gaps in residents' knowledge and may have reflected, in part, the increase in population since the last eruption in Cook Inlet. Keeping the public well-informed of volcanic hazards during eruptive and noneruptive periods is a central part of AVO's objectives. Operational roles and responsibilities among AVO and other agencies are outlined in the Alaska Interagency Operating Plan for Volcanic Ash Episodes (Madden and others, 2008) and are discussed further in Neal and others (this volume). This paper focuses on the preparation and application of AVO's communication tools and organization in response to public inquiries before and during the eruption.

Previous eruptions of Augustine occurred before the inception of AVO, and other recent eruptions in the Cook Inlet area predate widespread use of the Internet. The 2005–6 eruption of Augustine combined a greater population density in south-central Alaska with a public demand for 24/7 information through the Internet and television and radio newscasts, in addition to traditional daily print news. To meet these increased demands, AVO used an internal communications strategy that included three main parts—community education, internal strategies for external communication flow, and an improved Web site.

Laying a Foundation of Knowledge—Community Education and Involvement

Community Presentations and Outreach

When Augustine began showing signs of precursory unrest in late 2005, public interest in Cook Inlet volcanism was piqued. Beginning in May 2005, the AVO Education and Outreach (E and O) specialist led or coordinated about six presentations on the Kenai Peninsula in conjunction with the Kachemak Bay Environmental Education Alliance (KBEEA), a consortium of more than 15 natural resource organizations on the lower Kenai Peninsula. The majority of these were held during the summer and fall of 2005 at schools and community centers in Homer (pop. ~5,400), Kenai (pop. ~6,770), and Soldotna (pop. ~3,800) (Alaska Department of Labor and Workforce Development, 2010).

Although coordinated in mid-December 2005, on the morning of January 11, hours after the onset of the discrete, explosive eruptions at Augustine, staff from AVO and the Chief of the Homer Volunteer Fire Department participated in "Coffee Table," an hour-long radio call-in show on KBBI, Homer Public Radio. This radio show included live questions and answers about the volcanic activity and potential hazards, and advertised upcoming local presentations and an ash collection workshop scheduled in Homer for the following week (described below).

In December of 2005, KBEEA members requested AVO's participation in a public information meeting in Homer. They specifically sought information concerning the likely activity, impacts, and official response to an eruption of Augustine. With local input and assistance AVO staff developed a public presentation and discussion forum that were held in two back-to-back programs on January 19, 2006, at the interagency Islands and Ocean Visitor Center (appendix 1). Presenters from AVO, the West Coast and Alaska Tsunami Warning Center (WCATWC), the Kenai Peninsula Borough Office of Emergency Management, and the Kenai Peninsula Borough School District described the current volcanic unrest at Augustine and the preparedness and response activities of local, State, and Federal government organizations. A question and answer period followed the presentations. Additional representatives from the Federal Aviation Administration (FAA), the National Weather Service (NWS), Homer Fire Department, Homer Medical Center, South Peninsula Hospital, American Red Cross, and the U.S. Coast Guard were also available to answer questions. There were ~120 people in attendance at the programs.

From approximately January through August 2006, AVO staff gave about 25 presentations focused on Augustine at schools, museums, visitor centers, youth facilities, summer educational retreats, training venues (for example, National Park Service and FAA Anchorage Air Route Traffic Control Center), and professional society gatherings. During the same time frame, staff also gave about three dozen tours of the AVO Operations Center to a wide variety of groups ranging from nonprofit educational organizations, to public schools, media, and staff from other response agencies. For comparison, over the previous 7-month-long period (roughly May through December 2005), staff participated in approximately ten presentations (half of which were in Kenai and Homer) and more than 10 tours of the AVO Operations Center.

Citizen Ash-Fall Accounts and Sampling

AVO used civic speaking opportunities and other points of contact with the public to solicit information about ash-fall events, including sampling of ash fall, to assist AVO with scientific response to the eruption (Wallace and others, this volume). Staff also sought ash-fall observers and collectors from the NWS Cooperative Observer Program (Weather Spotters, http://www.weather.gov/os/coop/, last accessed February, 2008) and the State of Alaska Division of Community and Regional Affairs Community Database Online (http://www.commerce.state.ak.us/dca/commdb/CF_CONT.htm, last accessed February, 2008). Instructions and datasheets for making observations and collecting ash-fall samples were also prominently posted under the "Links" section on the AVO

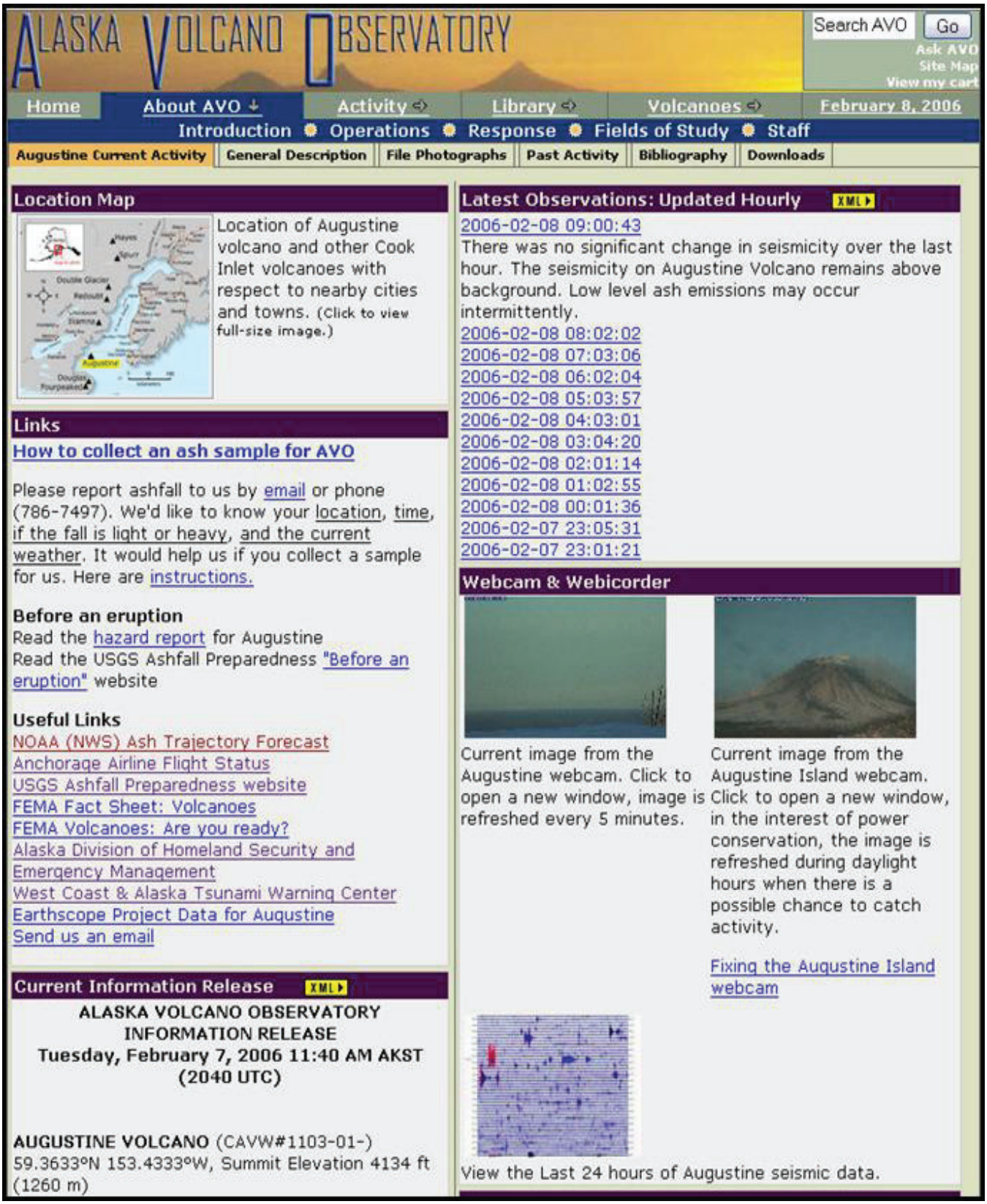

Figure 2. Part of the Alaska Volcano Observatory (AVO) Augustine Current Activity Web page from February 8, 2006.

Augustine Current Activity Web page (fig. 2) and all contacts were directed to this Web page for information about how to sample ash. On January 19, 2006, staff also conducted an ash-collection workshop in conjunction with the public information meetings in Homer.

During the eruption, 30 volcanic ash-fall samples were collected by 15 citizens. These samples make up the majority of off-island samples of ash collected from this eruption and are an important part of its scientific documentation (fig. 1; Wallace and others, this volume).

During the eruption, more than 130 individual calls and e-mails to AVO included reports concerning ash fall. If reported by telephone, staff then filled out an internal ash-fall account worksheet (appendix 2). All ash-fall observations were reported immediately by phone to colleagues at the NWS Anchorage Weather Forecast Office because NWS has formal ash-fall warning responsibility (Wallace and others, this volume; Neal and others this volume).

Preeruption Interagency Press Conference

On December 22, 2005, staff from AVO, National Oceanic and Atmospheric Administration (NOAA), and the State of Alaska Department of Homeland Security and Emergency Management held a joint press conference at the Aviation Technology Center in Anchorage (appendix 3). Local media coverage of the event aided in reminding the public of Augustine's previous, ongoing, and likely future activity and the chief hazards—airborne volcanic ash and ash fall. The press conference also reestablished the ongoing relationships among State, local, and Federal agencies in the event of an eruption. This is the first time a formal, interagency press conference was held before the onset of a forecasted volcanic eruption in Alaska.

AVO's Public Website

In March 2005, AVO upgraded its existing Web site from thousands of static pages to a dynamic, database-driven design. This change gave the Web site greater flexibility, enabling more real-time data feeds and information analysis products. The 2005–6 eruption of Augustine was the first significant Alaskan eruption to take place since the Web site upgrade. With increasing Internet connectivity for Alaskans and the rest of the world, AVO's improved public site gained a greater eruption response role, and this was the first eruption where the AVO Web site became a primary source for the general public to get information. Because of increased capabilities, the internal part of the site also was used extensively for staff collaboration, eruption documentation, operational scheduling, and record keeping.

In 2005–6, the public part of the AVO Web site served as a digital distribution center for information on Alaskan volcanoes, including background information, bibliographic resources (including free downloadable papers), photographs and maps, and real-time data feeds of Web-camera images and webicorders (described below). The Web site also facilitated the distribution of formal information products such as "Status Reports" and "Information Statements" (Neal and others, this volume). Once posted to the AVO Web site, formal notices were automatically posted to the Disaster Management Interoperability Service (DMIS) network as well.

During the Augustine unrest and eruption, all Augustine-specific information was gathered on an Augustine Current Activity Web page, prominently linked from AVO's homepage (fig. 2). It included background information, maps, photographs, all of the formal information products (see Neal and others, this volume), links to Augustine's webcams and webicorders, information on located earthquakes, a chronology of major eruption and eruption response events, and links to useful Web sites.

During the eruption, AVO received feedback that people and organizations needed information more often than formal information products were released (typically twice a day at the height of the eruption). In response to that request, the "Latest Observations" section was added as a feature on the public Augustine Current Activity Web page on January 13, 2006 (fig. 2). This feature allowed Operations Center staff to use an internal Web form and post informal summaries of activity at hourly (or periodic) intervals to the public page (fig. 3*A*).

Novel Data Streams on the Web

This eruption of Augustine was the first Alaskan eruption to make extensive use of Web cameras, or webcams. Eventually four webcams were oriented towards Augustine (Paskievitch and others, this volume) and images were displayed on the AVO Web site (fig. 2). The webcams acquired images every few minutes (sometimes every hour or every few hours), and people viewing these images accounted for approximately 30 percent of the outgoing data from the Web site. Individual images in this suite of webcam images were viewed close to 20 million times during January–February 2006.

Another new feature to the AVO Web site during the Augustine eruption was the addition of webicorders that show data from selected AVO seismic stations (fig. 2). Webicorders display the past 24 hours of seismic data and update in near real time. Server logs show that webicorders were popular with site users, and they also generated hundreds of e-mails to the AVO webmaster. Webicorder displays were accompanied on the Web by brief text that described the main types of seismic signals displayed, including regional earthquakes and calibration pulses.

AVO's fledgling image database grew to contain nearly 5,000 images of Augustine, about 1,000 of which are viewable on the public Web site. The new image database also saw increased usage—2.5 million requests to view these images were made in January–February 2006, more than 20 times the normal usage in previous months. In contrast, AVO's old site contained only dozens of images per eruption. The dramatic growth and use of an image database occurred for several

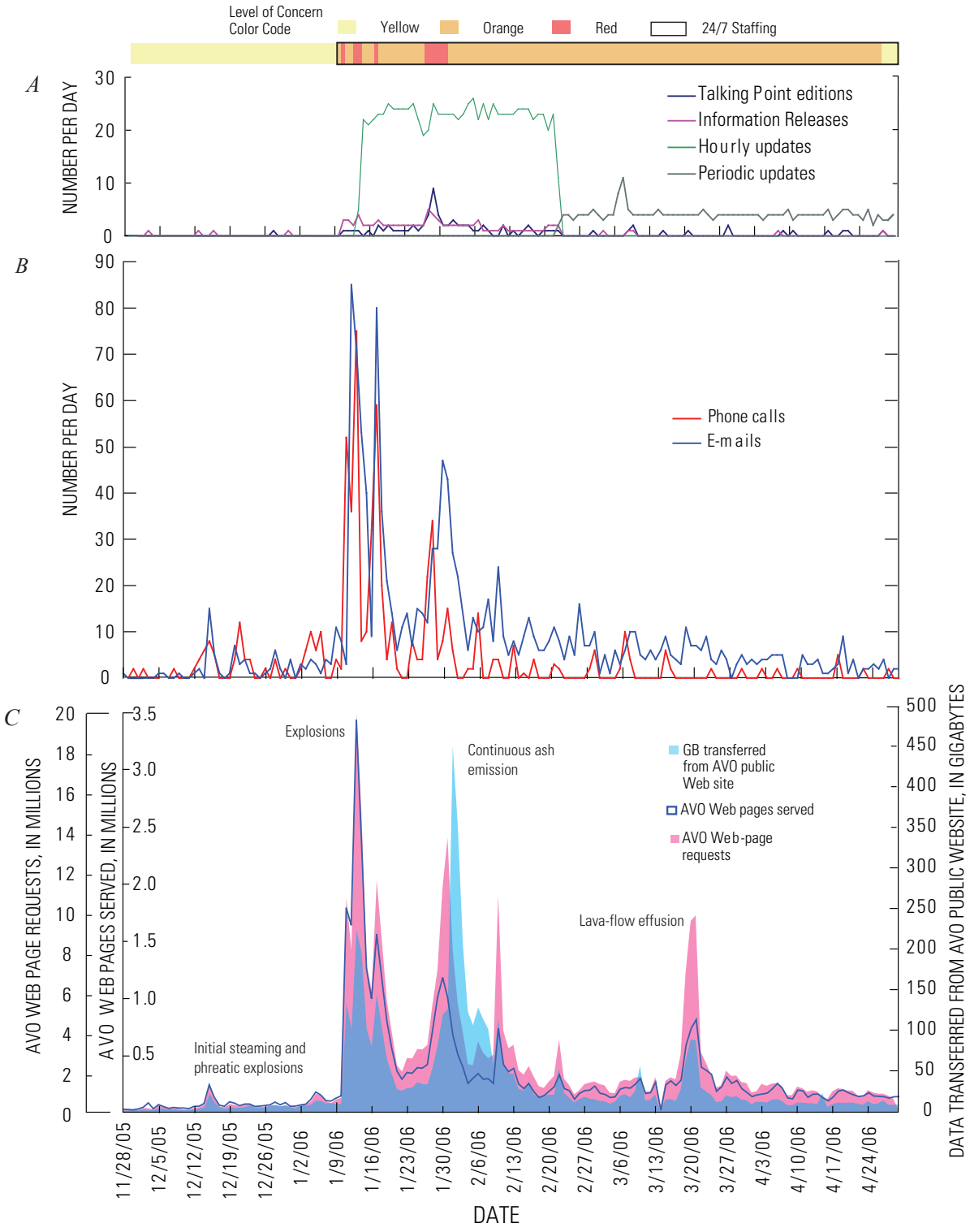

Figure 3. *A*, Daily totals of information items produced during the 2005–6 unrest and eruption at Augustine Volcano. Level of concern color code and period of 24/7 staffing at the Alaska Volcano Observatory (AVO) is shown along the top. *B*, Daily totals of recorded phone calls and e-mails received. *C*, AVO Web site statistics of gigabytes transferred, Web pages served and Web page requests. Each AVO Web page served consist of multiple objects (for example, pictures, style sheets, and javascript). Each individual object is counted as a request, thus the large difference in numbers between pages served and requests. Large spikes in the graph can be attributed to specific events during the unrest and eruption.

reasons. First, AVO now relies on digital cameras rather than film. Second, the image database made it relatively easy for staff to upload images and associated metadata (for example, photographer, date, and caption). Once in the database, scripting routines automatically create standardized thumbnail and screen-size resolution copies of the image, post them to public and internal Web sites, and generate unique and permanent Web-page addresses. Future placement and reference of the image on any AVO Web site can be done with just its database-assigned numerical identification number.

Web-usage Statistics

The 2006 eruption of Augustine created a huge increase in traffic to the AVO public Web site. During the eruption, the Web site was used heavily by agency responders and members of the public (fig. 3*C*), including visitors from 147 countries in January 2006. Each AVO Web page contains multiple objects (for example, pictures, style sheets, javascript) and each object is counted as a "request." During the Augustine unrest and eruption, the Web site logged more than 345 million requests, served more than 45 million pages, and distributed about 5.5 terabytes of data (fig. 3*C*). This was nearly half the total amount of data served by the AVO public Web site since its inception in December 1994 through the end of 2005.

As observed during response to the 2004 eruption of Mount St. Helens, the number of Web requests (described as "hits" in Driedger and others, 2008), waxed and waned relative to the activity at the volcano (fig. 3*C*). The high peaks in AVO Web-site statistics correspond to time periods of AVO level of concern color code Red (see Neal and others, this volume, for discussion of the color code). The busiest day for the site during the Augustine eruption was January 13, 2006, correspondent with several consecutive explosions (Coombs and others, this volume; fig. 3*C*). Similar but smaller peaks in Web-site usage occurred coincident with continuous ash emission in late January–early February and lava effusion in mid-March.

Communication Strategies for Answering Public Queries

Since the observatory's inception, AVO staff have engaged in communications with the media and the public during Cook Inlet volcanic eruptions. The demand for volcano information about the 1989–90 eruption of Redoubt Volcano quickly inundated AVO's small staff. During that eruption, hazard information was distributed by AVO to government and industry officials through printed updates and briefings. Briefings were also given to the news media and the general public (Brantley, 1990). During the 1992 eruption of Mount Spurr, AVO's use of updates, the level of concern color code, and direct personal communications worked well to inform the general public of anticipated eruptions and resultant hazards. AVO's outreach was aided by intensive media coverage through local and national radio, television, and newspaper outlets (Eichelberger and others, 1995).

During the 2005–6 Augustine unrest and eruption, almost all observatory staff engaged in communicating with the public at various times. Along with round-the-clock monitoring duties, staff members took at least 338 phone calls from media, local residents, interested people from around the world, and other Augustine-responding State and Federal agencies (fig. 3*B*). Because the AVO operations center was staffed by a diverse group of scientists from AVO offices in Anchorage and Fairbanks, as well as by other staff of the USGS Volcano Hazards Team (VHT), it was important to have a defined protocol for handling media and public inquiries and to ensure that current information on the activity of Augustine was available to all staff.

Media Management Plan

In December 2005, staff began writing a Media Management Plan (MMP) to serve as a guide for handling current and likely increasing media attention. Many of the approaches incorporated into this plan were previously used by AVO and VHT staff assisting with media inquiries during eruption

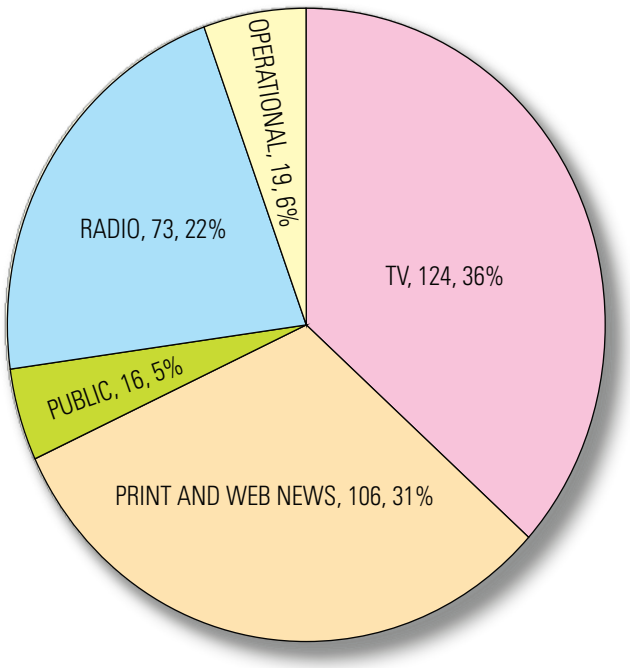

Figure 4. Sources of 338 reported phone calls made to the Alaska Volcano Observatory (AVO) from November 28, 2005, through May 16, 2006. Each wedge lists (1) source, (2) number of calls, and (3) percentage.

responses in Alaska and elsewhere. The MMP ensured message consistency and minimized disruption to scientists' other duties. The first MMP was implemented on December 27, 2005, and went through a few minor revisions as events at Augustine progressed. The MMP focused on (1) defining the roles of Media Coordinator and an Information Scientist, (2) providing information for interviews, (3) interview request guidelines, and (4) photo and video management guidelines.

The roles of the Media Coordinator and Information Scientist stemmed from the experience of staff and colleagues who participated in the Joint Information Center formed during the most recent eruption of Mount St. Helens in Washington (Driedger and others, 2008). The Media Coordinator, located in Anchorage, scheduled and organized venues, speakers, and graphical products (such as figures, video, and photos) for onsite and phone interviews. They also served as a point person for other staff with media needs, proactively coordinated local AVO press conferences, and coordinated the distribution of recent airborne observations and video imagery to media.

AVO and other U.S. volcano observatories have used the role of Information Scientist to orchestrate the release of information to the media and the public during earlier volcanic eruptions, including the 1989–90 eruptive sequence of Redoubt Volcano (Brantley, 1990). During the 2005–6 Augustine eruption, the Information Scientist, also located in Anchorage, was a week- to multi-week-long rotating position, working in conjunction with the Media Coordinator. The Information Scientist generated, updated, and distributed talking points (described below) and was often available for on-camera, radio, and phone interviews with the press. Members of both the AVO staff and the VHT outside of AVO served as Information Scientists during the Augustine eruption. Although the Information Scientist was usually tasked with meeting interview requests, those requests with a narrow focus on a particular subject were directed to the appropriate specialist(s). In total, AVO and VHT staff working in Alaska gave more than 350 on-camera, radio, phone and print media interviews from November 2005 through August 2006.

For the first few weeks following the January 11, 2006, onset of explosive magmatic activity at Augustine, press conferences were held almost daily in the AVO Operations Center. AVO representatives, principally the Information Scientist and the Media Coordinator, organized and attended these sessions and prepared new content, figures, and information with the explicit goal of meeting the 2:00 p.m. deadline for local television news stations.

Per the MMP, a single phone number for AVO—a longtime general phone number for the observatory—was publicized to the media. Calls to this number were answered by the Media Coordinator, the Information Scientist, and Operations Center staff. Callers were also reminded of AVO's up-to-date recorded information phone line and Web site as alternate primary sources for information.

On immediate return from observational and data-collection flights, scientists were asked to caption and upload digital photos in the AVO online image database and to notify the Web team to make these images available on the public Web site.

As the number of calls from the media and others increased (from a couple of calls per a day, to a record number of 75 reported calls on January 13), the range of question topics grew. AVO was asked about other agencies' information products, such as ash-fall and marine advisories, flight restrictions, restrictions of access to Augustine Island, and tsunami warning protocols, as well as general volcano hazard information and emergency preparedness guidelines. Later versions of the MMP, released in January 2006, included a list of public phone numbers and Web sites for use in redirecting public callers to the appropriate agency for questions about specific, non-AVO information products or announcements. An adaptation of this contact list was later included in the revised Interagency Operating Plan for Volcanic Ash Episodes (Madden and others, 2008). The entire MMP was updated (with new, local contacts and volcano-specific information) in response to the unrest and phreatic eruption of Fourpeaked volcano in September 2006 (Neal and others, 2009) and the eruption of Pavlof Volcano in the summer of 2007.

AVO's "Augustine Eruption Information" Files

Scientists must speak with a "single voice" to avoid confusion during hazardous events (Newhall and others, 1999). To ensure that AVO's information was authoritative and uniform, staff needed convenient access to consistent and up-to-date information. To this end, AVO staff compiled hard-copy talking points and other resources that were placed by each phone in the Anchorage Operations Center in "Augustine Eruption Information" binders. These items were available digitally to staff in Fairbanks and elsewhere through the internal AVO Web site and shared hard drive. Posting the information at all locations helped all AVO and VHT staff to provide accurate and specific information, and give similar accounts of current activity.

In late December 2005, AVO established the use of internal talking points pertinent to volcanic activity at Augustine. Talking points were typically generated and updated by the Information Scientist and summarized the most recent information pertaining to the eruption, possible hazards, and AVO response activities into concise bullets (Neal and others, this volume). AVO staff was encouraged to review the most recent talking points before each Operations Center shift, giving an interview, or answering a public question. From December 27, 2005, through April 30, 2006, there were about 80 editions of talking points (fig. 3*A*).

Other materials placed in the Augustine Eruption Information binders included (1) a set of brief facts regarding nearby populations, including community distances from Augustine; (2) talking points about the unlikely possibility of a volcanogenic tsunami from Augustine, compiled jointly by

AVO and the WCATWC; (3) a concise review Augustine's eruptive history and geology, gathered from the existing preliminary Augustine volcano-hazards assessment (Waythomas and Waitt, 1998).

As the eruption progressed, additional documents were added to the binders and appropriate electronic folders, including draft summaries of geophysical data time series, such as GPS data (Cervelli and others, this volume), a description of the deployment of ocean bottom seismometers (ten Brink, 2006), a description of Augustine's volcanic hazards and instrumentation (Ewert and others, 2005), and Augustine-related press releases from the USGS and UAF/GI.

Nature of Public Inquiries

Inquiries and observations from the media, the public, and cooperating agencies came to AVO by phone calls and e-mails. Users of the AVO public Web site were able to e-mail the AVO webmaster using a link on the footer of every Web page. Additional e-mail and phone calls were made directly to individual staff members. During the Augustine unrest and eruption, the AVO Web site also expanded its role as a proactive information provider—if interested parties could find the answer to their question on the Web site, they often didn't need to call or e-mail.

In an effort to evaluate the nature and effectiveness of AVO communications during the Augustine eruption, reported e-mails, phone calls, and Web traffic during the Augustine eruption were compiled, reviewed, and plotted relative to Augustine's level of concern color code. The greatest number of requests for information (phone calls, e-mails, and web traffic) correlate well with increased volcanic activity and elevated color codes (fig. 3). The volume of phone calls and e-mails roughly parallel each other, with a slight timing lag for e-mails.

Phone Calls to AVO

From November 28, 2005, through May 16, 2006, staff logged 338 phone calls, most regarding Augustine (fig. 3*B*; fig. 4). The highest numbers per day occurred when Augustine was at elevated color codes, a trend also noted in the number and timing of calls to the Joint Information Center during the 2004–6 eruption of Mount St. Helens (Driedger and others, 2008). Eighty-nine percent of the reported calls to AVO were from local, domestic, and international media, although media calls were likely overreported compared to calls from the public by Operations Center scientists. The majority of the media calls were from local and national television stations (36 percent) followed by local, national, and international print and Web-based press, such as Reuters and the Associated Press (31 percent; fig. 4). Local, national, and international radio contacts were responsible 22 percent of calls. Most media requests for a phone interview were fulfilled by the contacted staff member, but some calls from the media required coordination for onsite interviews or further response by a subject specialist.

Eleven percent of reported calls were from companies and agencies requesting information concerning their own hazards and preparedness operations (6 percent) and the general public (5 percent; fig. 4). The majority of calls regarding operational information concerned airborne volcanic ash, ash fall, the temporary flight restriction around Augustine, and calls from organizations asking if additional emergency response personnel from out of state were deployed or needed. Public callers sometimes gave informative eyewitness observations of volcanic activity (including the initial explosive onset on January 11, 2006) and reported ash fall. Observations were entered into the AVO internal logs. When appropriate, staff conveyed relevant public-reported observations to organizations such as the NWS.

During periods of inactivity as well as during eruptive activity, AVO maintains a phone line with a prerecorded message that repeats the most recent Information Release or Weekly Update. As stated at the beginning of the message, the number is not used to receive voice mail. Callers wishing to speak with someone are directed to call the AVO Anchorage public phone number. We have no way of determining the number of calls made to the AVO recorded information line.

The USGS Office of Communications staff in the Western Region (Seattle, Wash. and Menlo Park, Calif.) and at the USGS Headquarters (Reston, Va.) also reported receiving calls pertaining to the eruption (the number of calls received was not recorded), and they often referred callers to the AVO Web site or suggested individuals contact specific AVO staff (S. Hanna, L. Gordon, W. Lukas, and C. Ransom, written commun., 2008). The national "ASK USGS" phone service does not count the number or content of inquiries (K. Swanjord, oral commun., 2008). ADGGS staff did not receive a significant number of Augustine inquiries (J. Outten and P. Davis, written commun., 2008). The UAFGI Information Office did not count the number of calls it received about Augustine activity, but they did direct callers to appropriate UAFGI staff and use the AVO Web site to respond to general inquires (A. Hartley, oral commun., 2008).

E-mails to the AVO Webmaster

During this same period, from November 28, 2005, through May 31, 2006, staff logged and answered 1,336 e-mails to the AVO Web site (fig. 3*B*). During periods of low to no volcanic activity, the AVO Web site typically receives less than one e-mail per day. During the Augustine eruption, there were 676 e-mails in January 2006 alone—nearly 22 e-mails per day (fig. 3*B*). AVO staff rotated weekly in answering e-mail during the period of heaviest traffic (late December 2005 through January 2006). All e-mails (submissions and responses) are archived in a database, which allowed staff to (1) instantly determine if an e-mail had been answered, (2) cut and paste detailed and informative answers to commonly asked questions, (3) track correspondence with individuals,

and (4) create a searchable archive of questions for later analysis of AVO's communications. In most cases staff assigned to Web e-mail duty answered questions; in some instances they sought answers from specialists.

A first-order categorization of the e-mails during the Augustine eruptive period consists of 429 e-mails (~32 percent) with positive feedback to AVO (about the Web site, information products, and flow of information), 896 e-mails (~67 percent) containing comments, questions or suggestions, and 11 e-mails (0.8 percent) containing negative comments about the Web cameras and the timeliness of online updates. Pertinent observations (for example, ash fall or sulfur smell) in e-mails were reported in the AVO internal log and conveyed directly to on-duty monitoring staff.

Although e-mails from people in the vicinity of Augustine were the most numerous during AVO's eruption response, people e-mailed the AVO webmaster from as far away as the East Coast of the United States and foreign countries. The Web site e-mail address provided a way for people to ask nonurgent questions of AVO without tying up limited phone resources. Such questions included queries like "Do you think my summer cruise to Alaska will be cancelled?" and "Where can I find information about hot spot volcanoes?" People living in far-flung time zones often wanted to know why the webcam was dark (typically due to the late-rising sun during arctic winters). Timely response to these e-mails helped AVO build a good relationship as a credible source of technical information, both for Alaskans and people around the globe.

Lessons Learned and Suggestions for Improvement

During times of significant volcanic activity, the demands on AVO's communication systems and education and outreach program are dramatically increased. To meet these increased needs during the 2005–6 Augustine eruption, AVO implemented an internal communications strategy that improved the efficiency, consistency, and timeliness of public information distribution and communication. This internal strategy included use of dedicated outreach personnel for community presentations, a Media Management Plan, distribution of talking points and other updated documents to all staff, and a growing, dynamic, database-backed Web site. Application of this plan and use of improved communication tools allowed AVO to respond to a high volume of information requests and to meet education and outreach opportunities before, during, and following the eruption with accurate and timely information.

Owing to population expansion in Alaska and the spread of global Internet use, Alaskan eruptions now possess a higher degree of visibility than previously. Improvements could be made to AVO's public outreach and communications efforts; these include (1) A toll-free version of the AVO recorded message line would be useful to the public and outside organizations (because the current number is not a local call outside of Anchorage); (2) ensuring the means to organize, archive, duplicate, and edit digital video would ease the crunch of media video requests during periods of volcanic crisis (currently no AVO staff members are specifically tasked with digital video duplication and editing, and AVO's video library remains largely inaccessible to both internal users and the media); (3) continued development and evolution of the AVO public Web site (the site has already completed two major revisions since the Augustine eruption, and should continue to evolve and become more interactive, as Web 2.0 technologies mature and become mainstream).

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Appendix 1. Handout for Homer Public Meetings

Current Unrest at Augustine Volcano and Public Safety Response
January 19, 2006

The purpose of this meeting is to review the current volcanic unrest at Augustine Volcano and the response plans of local, state and federal government agencies.
A question and answer period will follow the presentations.

5:00pm - 6:30pm repeated 7:00pm – 8:30pm

Presentations

Welcome / Introduction	Alaska Volcano Observatory
Augustine Update	Alaska Volcano Observatory
Tsunami Hazard Review	NOAA's NWS West Coast and Alaska Tsunami Warning Center
Ash-fall Episode Plan	The Kenai Peninsula Borough Office of Emergency Management

Question and Answer Period

Panel participants from:

Alaska Volcano Observatory
West Coast and Alaska Tsunami Warning Center
Kenai Peninsula Borough
Federal Aviation Authority
National Weather Service

FOR MORE INFORMATION:

Please check the information tables in the lobby and visit the following websites:

Alaska Volcano Observatory	www.avo.alaska.edu/
West Coast and Alaska Tsunami Warning Center	http://wcatwc.arh.noaa.gov/
Kenai Peninsula Borough	http://www.borough.kenai.ak.us/emergency/default.htm
Federal Aviation Authority	http://www.alaska.faa.gov/
National Weather Service	http://www.arh.noaa.gov/
	http://pafc.arh.noaa.gov/augustine.php

Appendix 2. Ash-fall Account Worksheet

ASH-FALL ACCOUNTS

WHAT TO ASK FOR*

*If caller is interested in collecting, refer to www.avo.alaska.edu/ashfall.php

DATE: _____
LOCATION: _____
TIME: _____
DURATION: _____
AMOUNT OF ASH COLLECTED: _____
WEATHER CONDITIONS AT TIME OF COLLECTION: _____ _____
_____
NAME OF COLLECTOR: _____
CONTACT INFORMATION: _____

ON DUTY OPERATIONS ROOM STAFF

☐ Call or fax accounts to National Weather Service Anchorage Weather Forecast Office

☐ Enter ash-fall account into the Eruption Chronology

☐ Enter ash-fall details into Ash-fall Account Log

☐ Add to AVO internal website logs

☐ Archive

Any of these duties can be delegated so long as by the end of your duty shift all accounts are properly cataloged.

Appendix 3. Joint USGS-NOAA Media Advisory

USGS science for a changing world

NEWS FROM NOAA
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION • US DEPARTMENT OF COMMERCE

Media Advisory

December 21, 2005	Audrey Rubel	(907) 271-4767	Audrey.Rubel@noaa.gov

Augustine Volcano Preparedness News Briefing

Changes in earthquake activity have been detected at Augustine Volcano along with subtle ground deformation and increased gas and steam emissions. Several small steam explosions occurred at the volcano last week. The potential impacts from volcanic ash and the possibility of a tsunami in the Lower Cook Inlet region of Alaska call for increased public awareness. The effects upon public health, property, and the marine and aviation communities will be discussed.

WHAT:

The Alaska Volcano Observatory and NOAA National Weather Service are hosting a news briefing regarding the status of Augustine Volcano and recent preparedness activities.

WHERE:

University of Alaska Anchorage
Aviation Technology Center, Rooms 127 and130
2811 Merrill Field Drive
Anchorage, Alaska 99501
Directions: http://www.uaa.alaska.edu/ctc/programs/aviation/about/

WHEN:

Thursday, December 22, 2005, Time: 10:00 AM

WHO:

Christina "Tina" Neal, volcanologist, United States Geological Survey, Alaska Volcano Observatory

Dr. John Power, seismologist, United States Geological Survey, Alaska Volcano Observatory

Jeff Osiensky, Alaska regional warning coordination meteorologist and National Weather Service volcanic ash program manager, NOAA National Weather Service Alaska Region Headquarters

Paul Whitmore, director, NOAA National Weather Service, West Coast/Alaska Tsunami Warning Center

Jim Butchart, deputy director for emergency management, State of Alaska Division of Homeland Security and Emergency Management

More information on Augustine Volcano is available online at:
http://www.avo.alaska.edu/ and http://pafc.arh.noaa.gov/augustine.php

The Alaska Volcano Observatory is a cooperative program of the U. S. Geological Survey, the University of Alaska Geophysical Institute, and the Alaska Division of Geological & Geophysical Surveys.

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